1.9.12

AI24BTECH11021 - Manvik Muthyapu

Question:

Find the length of the segment joining $\mathbf{A}(-6, 7)$ and $\mathbf{B}(-1, -5)$. Also, find the midpoint of $\mathbf{AB}$. (10, 2021)

Solution:

Variable	Description
A	$\begin{pmatrix} -6 \\ 7 \end{pmatrix}$
B	$\begin{pmatrix} -1 \\ -5 \end{pmatrix}$
M	$\frac{A+B}{2}$

1) Length of line segment is $\|B - A\|$.

$$B - A = \begin{pmatrix} -1 \\ -5 \end{pmatrix} - \begin{pmatrix} -6 \\ 7 \end{pmatrix} \tag{1}$$

$$= \begin{pmatrix} 5 \\ -12 \end{pmatrix} \tag{2}$$

$$\|B - A\| = \sqrt{(B - A)^T (B - A)} \tag{3}$$

$$= \sqrt{(5)^{[2]} + (-12)^2} = \sqrt{169} \tag{4}$$

$$= 13\text{cm} \tag{5}$$

∴ The length of line segment is 13 cm.

2) Midpoint of line segment

$$M = \frac{A + B}{2} \tag{6}$$

$$= \frac{\begin{pmatrix} -6 \\ 7 \end{pmatrix} + \begin{pmatrix} -1 \\ -5 \end{pmatrix}}{2} = \frac{\begin{pmatrix} -7 \\ 2 \end{pmatrix}}{2} \tag{7}$$

$$= \begin{pmatrix} -3.5 \\ 1 \end{pmatrix} \tag{8}$$

$$\therefore M = \begin{pmatrix} -3.5 \\ 1 \end{pmatrix}$$